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(54) Title of Invention: NONDIRECTIONAL ANTENNA

Abstract:

Disclosed is a nondirectional diversity antenna, in which radiation efficiency in an inward direction of a board is enhanced to prevent radiation efficiency from being lowered in a certain direction, so that there is little signal attenuation in any direction and diversity is achieved to increase a transmission distance. The nondirectional antenna, integrated with a wireless local area network (WLAN) card including a printed circuit board on which a signal processing circuit including a wireless transmitting/receiving circuit is formed, includes: an antenna unit comprising a conductive plate having a length equal to 1/4 of a wavelength of a signal received thereby; a first connection member that secures one end of the antenna unit to be separated from the printed circuit board by a length of $\lambda/8$ while connecting the one end of the antenna unit to a ground terminal; and a second connection member that secures a part of the antenna unit separated a predetermined length from the one end of the antenna unit to be separated from the printed circuit board by a length of $\lambda/8$ while connecting the part of the antenna to an input/output terminal for transmitting/receiving signals. Further, a plurality of antenna units in which the conductive plate is separated into two parts slidably connected to each other is used, thereby achieving diversity.

Representative Drawings

Fig. 2

Index words

Wireless LAN, Nondirectional, antenna, diversity, slide type

Specification

Brief Explanation of Drawings

Fig. 1 is a schematic view of an antenna mounted on a general wireless local area network (LAN) card.
Fig. 2 is a schematic view of a nondirectional antenna according to one embodiment of the present invention.
Fig. 3 is a schematic view of a nondirectional antenna according to another embodiment of the present invention.

<Reference Numerals for the Drawings>

21, 32: printed circuit board
22, 32, 32' : antenna unit
23, 34, 34' : first connecion unit
24, 33, 33' : second connection member

Detailed Description of the Invention

Objective of the Invention

Pertinent Art and Prior Art

The present invention relates to an antenna provided in a wireless LAN card or the like, and more particularly, to a nondirectional diversity antenna that improves radiation efficiency in all directions.

In general, a device having a built-in antenna like a wireless LAN card, etc. is manufactured by printing an antenna pattern on one side of a printed circuit board on which a signal transmitting/receiving circuit, a data processing circuit, etc. are printed.

An exemplary embodiment of this will be shown in Fig. 1.

The foregoing case of printing an antenna pattern 20 on a printed circuit board 10, thereby providing the built-in antenna, is effective in terms of reduction in size or production costs, but a uniform radiation pattern in all directions is not achieved.

That is, radiation power is lowered in an inward direction of the printed circuit board 10 because of the dielectric constant of the board. In Fig. 1, the direction and amplitude of the radiation pattern based on the antenna pattern 20 are shown in the form of an arrow, in which the inward radiation pattern is far smaller than the outward radiation pattern.

Additionally, in the case of patterning the antenna, the antenna pattern is generally coated with a thin film (solder resist) like a circuit pattern, such that radiation efficiency is lowered even in a perpendicular direction.

Accordingly, such a conventional antenna structure lowers radiation efficiency in a certain direction and lowers receive sensitivity, so that communication performance can be deteriorated when a neighboring computer is disposed in a direction in which radiation efficiency is low.

Thus, when establishing a wireless LAN, it is inconvenient to have to determine a direction in which radiation efficiency is high and dispose the computers in this direction.

Technical Problems to be solved by the Invention

To solve the problems of the prior art as described above, an object of the present invention is to provide a nondirectional diversity antenna, in which radiation efficiency in an inward direction of a board is enhanced to prevent radiation efficiency from being lowered in a certain direction, so that there is little signal attenuation in any direction.

Another object of the present invention is to provide a nondirectional diversity antenna, the length of which is variable, to increase a transmission distance.

Constitution and Operation of the Invention

In accordance with the present invention, the above and other objects can be achieved by the provision of a nondirectional antenna integrated with a wireless local area network (WLAN) card including a printed circuit board on which a signal processing circuit including a wireless transmitting/receiving circuit is formed, the nondirectional antenna including: an antenna unit which includes a conductive plate having a length equal to 1/4 of a wavelength of a signal received thereby; a first connection member that

secures one end of the antenna unit to be separated from the printed circuit board by a length of λ/8 (λ= the wavelength of the signal) while connecting the one end of the antenna unit to a ground terminal; and a second connection member that secures a part of the antenna unit separated a predetermined length from the one end of the antenna unit to be separated from the printed circuit board by a length of λ/8 while connecting the part of the antenna to an input/output terminal for transmitting/receiving signals.

Embodiments of the present invention will hereinafter be described in detail with reference to the accompanying drawings.

Fig. 2 is a schematic view of a nondirectional antenna according to one embodiment of the present invention. In the nondirectional antenna of this embodiment, an antenna unit 22 has a predetermined thickness and a length equal to λ/4 (where, λ is a wavelength of a signal received thereby). The antenna unit 2 is connected at one end thereof to a ground terminal of a printed circuit board 21, which has a wireless transmitting/receiving circuit formed thereon, through a first connection member 23 having a length of λ/8, and a part of the antenna unit 22 separated a predetermined length (e.g., λ/8 ~ λ/10) from the one end of the antenna unit 22 having the first connection member 23 connected thereto is connected to an input/output terminal for transmitting/receiving signals of the printed circuit board 21, which has the wireless transmitting/receiving circuit formed thereon, through a second connection member 24 having a length of λ/8. The first and second connection members 23, 24 are conductors for transmitting electrical signals, which may be manufactured by printing a pattern on a plastic base or may be formed of metal plates having conductive properties and an enough thickness to support the antenna unit 22.

Fig. 3 is a schematic view of a nondirectional antenna according to anther embodiment of the present invention. In the nondirectional antenna of this embodiment, first and second antenna units 32, 32' are formed in a two-stage separation type and provided to have a length of λ/4 when pulled out maximally by minimizing an overlapped part, one end of each of the first and second antenna units 32, 32' is connected and fixed to a ground terminal GND of a printed circuit board 31 through a first connection member 34, 34' having a predetermined length (i.e., λ/8), middle parts of the first and second antenna units 32, 32' are respectively connected and secured to the input and output terminals Rx/Tx for transmitting/receiving signals of the printed circuit board 31 through the second connection members 33, 33'. The other end

of each of the first and second antenna units 32, 33' is formed with a grip 35, 35' so as to be retractable, and the printed circuit board 31 provided with the first and second antenna units 32, 32' is put in a case 30 so that the grips 35, 35' of the first and the second antenna units 32, 32' can be exposed to the outside.

As such, the antenna unit 22 is connected to the printed circuit board 21 via the first and second connection members 23, 24 and serves as an antenna. In this case, the antenna unit 22 is separated a predetermined distance (i.e., $\lambda/8$) from the printed circuit board 21 by the first and second connection members 23, 24. Further, since electromagnetic waves for signal transmission/reception exhibit spreading and propagation properties, attenuation is significantly lowered even when a transmission/reception distance is short.

For example, if a transmitting/receiving band generally used in a wireless LAN is 2.4GHz, the wavelength $\lambda = \frac{c}{f} = 3 \times 10^{10} / 2.4 \times 10^{9} = 12.5$ cm. Thus, the antenna 22 has a length of $\lambda/4$ =12.5cm/4=3.125 cm. Further, a distance between the antenna unit 22 and the printed circuit board 21 is about 1.5625 cm. Further, the WLAN card generally has a width of 4.6 cm, and thus there is no problem of mounting this antenna to the inside of the WLAN card.

Further, when not in use, the nondirectional diversity antenna as shown in FIG. 2 can be entirely inserted into a standard case 30 of the WLAN card by pushing the grips 35, 35' as deep as possible to minimize the length of the first and second antenna units 32, 32'. On the other hand, when in use, the nondirectional diversity antenna can operate to transmit and receive a signal in a preset band with maximum radiation efficiency by pulling the grips 35, 35' out as much as possible to increase the length of the first and second antenna units 32, 32'.

Also, the first and second antenna units 32, 32' are all separated from the printed circuit board 31 by a predetermined length (i.e., $\lambda/8$), so that the distance can cause a signal to be transmitted or received even in a direction toward the printed circuit board 31 without significant attenuation.

Furthermore, two antennas 32, 32' are used for transmitting and receiving the signal, and thus diversity is achieved, thereby increasing a transmission distance as

compared with the existing case of using one antenna.

Effects of the Invention

As apparent from the above description, according to an exemplary embodiment, in a wireless transceiver with a built-in antenna, e.g., a WLAN or the like, a predetermined distance is provided between the printed circuit board and the antenna, so that signal attenuation toward the printed circuit board can be reduced and radiation efficiency can be improved in all directions, thereby achieving a nondirectional diversity antenna. In addition, two separable antennas are mounted to the printed circuit board with a predetermined distance between the antennas and the printed circuit board, so that the diversity antenna can be achieved to increase the transmission distance.

WHAT IS CLAIMED IS:

1. A nondirectional antenna integrated with a wireless local area network (WLAN) card comprising a printed circuit board on which a signal processing circuit comprising a wireless transmitting/receiving circuit is formed, the nondirectional antenna comprising:

an antenna unit comprising a conductive plate having a length equal to 1/4 of a wavelength of a signal received thereby;

a first connection member that secures one end of the antenna unit to be separated from the printed circuit board by a length of $\lambda/8$ (where λ is the wavelength of the signal) while connecting the one end of the antenna unit to a ground terminal; and

a second connection member that secures a part of the antenna unit separated a predetermined length from the one end of the antenna unit to be separated from the printed circuit board by a length of $\lambda/8$ while connecting the part of the antenna to an input/output terminal for transmitting/receiving signals.

2. A nondirectional antenna integrated with a wireless local area network (WLAN) card comprising a printed circuit board on which a signal processing circuit comprising a wireless transmitting/receiving circuit is formed, the nondirectional antenna comprising:

first and second antenna units in which two conductive plates each having a predetermined length are slidably connected to have a maximum length of a 1/4 wavelength of a signal received thereby;

a first connection member that secures one end of each of the first and second antenna units to be separated from the printed circuit board by a length of $\lambda/8$ (where λ is the wavelength of the signal) while connecting the one end of each of the first and second antenna units to a ground terminal; and

a second connection member that secures a part of each of the first and second antenna units separated a predetermined length from the one end of each of the first and second antenna units having the first connection member connected thereto to be separated a length of $\lambda/8$ from the printed circuit board while connecting the part of each of the first and second antenna units to an input/output terminal for transmitting/receiving signals.

[Figures]

Fig. 1

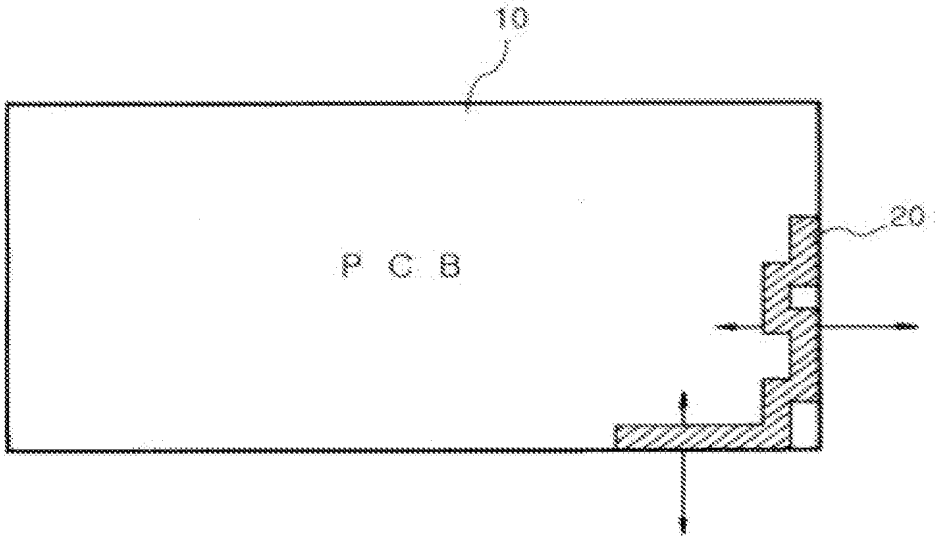

Fig. 2

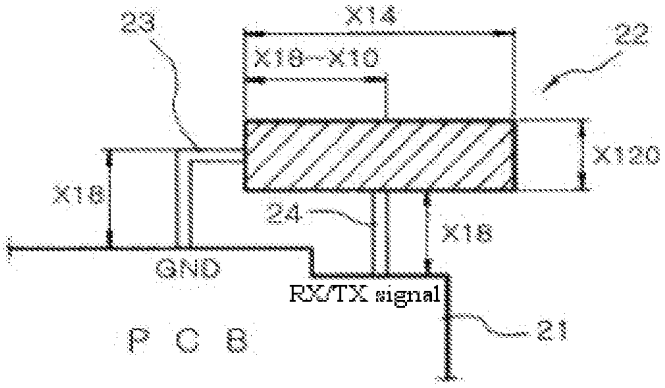

Fig. 3